1. Which of the following fractions lie between $\frac{1}{5}$ and $\frac{1}{4}$?

A. $\frac{7}{33}$ B. $\frac{4}{11}$ C. $\frac{13}{57}$ D. $\frac{7}{17}$

(a) A and B (b) A and C

(c) B, C and D (d) A, B and D

2. Express $0.\overline{34} + 0.3\overline{4}$ as a single decimal.

(a) $0.6\overline{788}$ (b) $0.6\overline{89}$

(c) $0.68\overline{78}$ (d) $0.6\overline{87}$

3. If $\sqrt{5^n} = 125$, then $5^{\sqrt[n]{64}}$ = ______.

(a) 25 (b) $\frac{1}{125}$

(c) 625 (d) $\frac{1}{25}$

4. If $x^4 + 1 = 1297$ and $y^4 - 1 = 2400$, then $y^2 - x^2$ = ______.

(a) 10 (b) 25

(c) 13 (d) 43

5. What is the value of 4^{2x-2}, if $(16)^{2x+3} = (64)^{x+3}$?

(a) 64 (b) 256

(c) 32 (d) 512

6. Which of the following pairs is having two equal values? (where $x \in R$) ______.

(a) $9^{x/2}, 24^{x/3}$ (b) $(256)^{4/x}, (4^3)^{4/x}$

(c) $(343)^{x/3}, (7^4)^{x/12}$ (d) $(36^2)^{2/7}, (6^3)^{2/7}$

7. The expression $\left(\sqrt{5}-\sqrt{3}\right)\left(\sqrt{7}-\sqrt{2}\right)$ when simplified becomes a

(a) simple surd. (b) mixed surd.

(c) compound surd. (d) binomial surd.

8. If m and n are positive integers, then for a positive number a, $\left\{\sqrt[m]{\left(\sqrt[n]{a}\right)}\right\}^{mn}$ = ______.

(a) a^{mn} (b) a

(c) $a^{m/n}$ (d) 1

9. If $2^{-m} \times \frac{1}{2^m} = \frac{1}{4}$, then $\frac{1}{14}\left[(4^m)^{1/2} + \left(\frac{1}{5^m}\right)^{-1}\right] =$

[✓ (a) $\frac{1}{2}$] (b) 2

(c) 4 (d) $\frac{-1}{4}$

10. The surds $\sqrt{2}, \sqrt[3]{3}$ and $\sqrt[5]{5}$, in their descending order are

(a) $\sqrt[3]{3}, \sqrt[5]{5}, \sqrt{2}$ [✓ (b) $\sqrt{2}, \sqrt[3]{3}, \sqrt[5]{5}$]

(c) $\sqrt{2}, \sqrt[5]{5}, \sqrt[3]{3}$ (d) $\sqrt[3]{3}, \sqrt{2}, \sqrt[5]{5}$

11. $2[(16-15)^{-1} + 25\ (13-8)^{-2}]^{-1} + (1024)^0 =$ _____.

[✓ (a) 2] (b) 3

(c) 1 (d) 5

12. If $x = 2$ and $y = 4$, then $\left(\frac{x}{y}\right)^{x-y} + \left(\frac{y}{x}\right)^{y-x} =$ _____.

(a) 4 [✓ (b) 8]

(c) 12 (d) 2

13. In which of the following pairs of surds are the given two surds similar?

(a) $\sqrt{5}, 7\sqrt{5}$ (b) $\sqrt[3]{7}, \sqrt[2]{7}$

(c) $\sqrt{7}, \sqrt{28}$ [✓ (d) Both (a) and (c)]

14. Which of the following is the greatest?

(a) 7^2 (b) $(49)^{3/2}$

(c) $\left(\frac{1}{343}\right)^{-1/3}$ (d) $(2401)^{-1/4}$

15. $(\sqrt[6]{5})(\sqrt[3]{2})(\sqrt{3})(\sqrt[12]{6}) =$

(a) $\sqrt[12]{1749600}$ (b) $\sqrt[3]{2} \times \sqrt[12]{109350}$

(c) $\sqrt[12]{177960}$ (d) Both (a) and (b)

16. If $p = 3$ and $q = 2$, then $(3p-4q)^{q-p} \div (4p-3q)^{2q-p}$ = _____.

(a) 1 (b) 6

[✓ (c) $\frac{1}{6}$] (d) $\frac{2}{3}$

17. $\left[\frac{(32)^{0.2} + (81)^{0.25}}{(256)^{0.5} - (121)^{0.5}}\right] =$ _____.

(a) 2 (b) 5

[✓ (c) 1] (d) 11

18. Which of the following surd is the smallest?
$\sqrt{10}-\sqrt{5}$, $\sqrt{19}-\sqrt{14}$, $\sqrt{22}-\sqrt{17}$ and $\sqrt{8}-\sqrt{3}$

(a) $\sqrt{10}-\sqrt{5}$ (b) $\sqrt{19}-\sqrt{14}$

(c) $\sqrt{22}-\sqrt{17}$ (d) $\sqrt{8}-\sqrt{3}$

19. If $\sqrt{m} = \sqrt{a} + \sqrt{c}$ and $\sqrt{m}$, $\sqrt{a}$ and $\sqrt{c}$ are three surds, then

(a) $\sqrt{m}$ is dissimilar to $\sqrt{a}$ and $\sqrt{c}$.

(b) $\sqrt{a}$ and $\sqrt{c}$ are similar to $\sqrt{m}$.

(c) only $\sqrt{a}$ is similar to $\sqrt{m}$.

(d) None of these

20. The surd obtained after rationalizing the numerator of $\frac{4-\sqrt{25-a}}{a-9}$ is equal to

(a) $\frac{a-9}{4-\sqrt{25-a}}$

(b) $\frac{1}{4-\sqrt{25-a}}$

(c) $\frac{1}{(a-9)(4+\sqrt{25-a})}$

(d) $\frac{1}{4+\sqrt{25-a}}$

21. If $\sqrt{13 - x\sqrt{10}} = \sqrt{8} + \sqrt{5}$, then what is the value of x?

(a) −5 (b) −6

(c) −4 (d) −2

22. If the surds $\sqrt[4]{4}, \sqrt[6]{5}, \sqrt[8]{6}$ and $\sqrt[12]{8}$ are arranged in ascending order from left to right, then the third surd from the left is

(a) $\sqrt[12]{8}$ (b) $\sqrt[4]{4}$

(c) $\sqrt[8]{6}$ (d) $\sqrt[6]{5}$

23. $\sqrt{11\sqrt{11\sqrt{11 \ldots 4 \text{ terms}}}} =$

(a) $\sqrt[16]{11^5}$ (b) $\sqrt[16]{11}$

(c) $\sqrt[16]{11^{14}}$ (d) $\sqrt[16]{11^{15}}$

24. If $\frac{5-\sqrt{3}}{2+\sqrt{3}} = x + y\sqrt{3}$, then (x, y) is

(a) (13, −7) (b) (−13, 7)

(c) (−13, −7) (d) (13, 7)

25. The simplified form of $\sqrt{125}+\sqrt{125}-\sqrt{845}$ is

(a) $\sqrt{15}$ (b) $2\sqrt{5}$

(c) $-\sqrt{5}$ (d) $-2\sqrt{5}$

26. Which of the following statements is true?

I. If x is a conjugate surd of y, then x can be a RF of y.

II. If x is a RF of y, then x need not be the conjugate of y.

(a) Only I (b) Only II

(c) Both I and II (d) Neither I nor II

27. If $\frac{3-2\sqrt{5}}{6-\sqrt{5}}=a+b\sqrt{5}$ where a and b are rational numbers, then what are the values of a and b?

(a) $\frac{8}{35},\frac{-9}{35}$ (b) $\frac{8}{31},\frac{-9}{31}$

(c) $\frac{-8}{31},\frac{9}{31}$ (d) $\frac{-8}{35},\frac{9}{35}$

28. If $\frac{3^{5x}\times(81)^2\times 6561}{3^{2x}}=3^7$, then $x=$________

(a) 3 (b) −3

(c) $\frac{1}{3}$ (d) $\frac{-1}{3}$

29. If $\sqrt{2^n}=1024$, then $3^{\left(\frac{n}{4}-4\right)}=$ ________.

(a) 3 (b) −3

(c) 27 (d) 81

30. If $\left[\left\{\left(\frac{1}{7^2}\right)^{-2}\right\}^{-1/3}\right]^{1/4}=7^m$, then $m=$ ________.

(a) $\frac{-1}{3}$ (b) $\frac{1}{4}$

(c) −3 (d) 2

Level 2

31. $\left[\left\{\left(\frac{1}{x^{a^2-b^2}}\right)^{\frac{1}{a-b}}\right\}^{a+b}\right]^{\frac{1}{(a+b)^2}}=$ ________.

(a) x^2 (b) $\frac{1}{x}$

(c) 7^3 (d) $\frac{1}{x^2}$

32. If $\frac{2^{m+n}}{2^{m-n}}=16$ and $a=2^{\frac{1}{10}}$ then $\frac{(a^{2m+n-p})^2}{(a^{m-2n+2p})^{-1}}=$ ________.

(a) 2 (b) $\frac{1}{4}$

(c) 9 (d) $\frac{1}{8}$

33. Simplify

$\left[(p^{-1}+q^{-1})(p^{-1}-q^{-1})\div\left(\frac{1}{p^{-1}}-\frac{1}{q^{-1}}\right)\left(\frac{1}{p^{-1}}+\frac{1}{q^{-1}}\right)\right](pq)^2$.

(a) $(pq)^2$ (b) −1

(c) $-(pq)^{-2}$ (d) 1

34. If $x=\frac{2}{\sqrt{10}-\sqrt{8}}$, $y=\frac{2}{\sqrt{10}+2\sqrt{2}}$, then $(x-y)^2=$

(a) $4\sqrt{2}$ (b) 32

(c) $8\sqrt{2}$ (d) 64

35 If $a=\sqrt{6}-\sqrt{3}$, $b=\sqrt{3}-\sqrt{2}$ and $c=\sqrt{2}-\sqrt{6}$, then find the value of $a^3+b^3+c^3-2abc$.

(a) $3\sqrt{2}-5\sqrt{3}-\sqrt{6}$

(b) $3\sqrt{2}-5\sqrt{3}-\sqrt{6}$

(c) $3\sqrt{2}-4\sqrt{3}+\sqrt{6}$

(d) $3\sqrt{2}+4\sqrt{3}+\sqrt{6}$

36. $\sqrt{\frac{81}{64}\sqrt{\frac{81}{64}\sqrt{\frac{81}{64}\sqrt{\frac{81}{64}}}}}\cdots\infty=$

[✓ (a) $\frac{81}{64}$] (b) $\frac{9}{8}$

(c) $\frac{3}{2}$ (d) $\frac{3}{2\sqrt{2}}$

37. If $a^p=b^q=c^r=abc$, then $pqr=$ ________.

(a) p^2q+q^2r

(b) $pq+qr+pr$

(c) $(pq+qr+rp)^2$

(d) $pq(qr+rp)$

19

38. The value of $\left[(23+2^2)^{2/3}+(140-29)^{1/2}\right]^2$ is ________.

(a) 196 (b) 289

(c) 324 [✓ (d) 400]

39. If $x=\sqrt{6}+\sqrt{5}$, then $x^2+\frac{1}{x^2}-2=$

(a) $2\sqrt{6}$ (b) $2\sqrt{5}$

(c) 24 (d) 20

40. $\sqrt{6+\sqrt{6+\sqrt{6+\ldots\infty}}}$ is equal to ________.

(a) −3 (b) 3

(c) 6 (d) 2

41. Simplify

$$\frac{1}{\sqrt{19-\sqrt{360}}}-\frac{1}{\sqrt{21-\sqrt{440}}}+\frac{2}{\sqrt{20+\sqrt{396}}}=$$

________.

(a) 1 (b) 2

(c) 0 (d) None of these

42. If $a=\sqrt{17}-\sqrt{16}$ and $b=\sqrt{16}-\sqrt{15}$ then

(a) $a<b$ [✓ (b) $a>b$]

(c) $a=b$ (d) None of these

43. $\left(\sqrt[6]{15-2\sqrt{56}}\right)\cdot\left(\sqrt[3]{\sqrt{7}+2\sqrt{2}}\right)=$ ________.

(a) 0 (b) 1

(c) −1 (d) 2

44. $\sqrt{\sqrt{63}+\sqrt{56}}=$

(a) $\sqrt[4]{7}(\sqrt{3}+\sqrt{5})$ (b) $\sqrt[4]{7}(\sqrt{3}+1)$

(c) $\sqrt[4]{7}(\sqrt{3}+\sqrt{5})$ (d) $\sqrt[4]{7}(\sqrt{2}+1)$

45. If $\frac{\sqrt{7}+2\sqrt{3}}{2\sqrt{7}-\sqrt{5}}=\frac{c+\sqrt{p}+\sqrt{q}+\sqrt{r}}{23}$ $(p<q<r)$, where p, q, r are rational numbers, then $q+r-p=$

(a) 361 (b) 302

(c) 418 (d) 426

46. The following are the steps involved in finding the value of $x-y$ from $\frac{8-\sqrt{5}}{8+\sqrt{5}}=x-y\sqrt{40}$. Arrange them in sequential order.

(A) $\frac{13-2\sqrt{40}}{8-5}=x-y\sqrt{40}$

(B) $\frac{(\sqrt{8})^2+(\sqrt{5})^2-2(\sqrt{8})(\sqrt{5})}{(\sqrt{8})^2-(\sqrt{5})^2}=x-y\sqrt{40}$

(C) $x-y=\frac{11}{3}$

(D) $x=\frac{13}{3}$ and $y=\frac{2}{3}$

(E) $\frac{(\sqrt{8}-\sqrt{5})(\sqrt{8}-\sqrt{5})}{(\sqrt{8}+\sqrt{5})(\sqrt{8}-\sqrt{5})}=x-y\sqrt{40}$

(a) EABDC

(b) EBADC

(c) ABDEC

(d) DEBAC

47. The following are the steps involved in finding the least among $\sqrt{3}$, $\sqrt[3]{4}$ and $\sqrt[6]{15}$. Arrange them in sequential order.

(A) $\therefore \sqrt[6]{15}$ is the smallest.

(B) $\therefore 3^{1/2}=3^{3/6}$, $4^{1/3}=4^{2/6}$, $15^{1/6}=15^{1/6}$

(C) The LCM of the denominators of the exponents is 6.

(D) $\sqrt{3}=3^{1/2}$, $\sqrt[3]{4}=4^{1/3}$, $\sqrt[6]{15}=15^{1/6}$

(E) $\therefore \sqrt{3}=\sqrt[6]{27}$, $\sqrt[3]{4}=\sqrt[6]{16}$, $\sqrt[6]{15}=\sqrt[6]{15}$

(a) DCABE (b) DABEB

(c) DCBEA (d) DBCAE

48. If $y=3-\sqrt{8}$, then $\left(y-\frac{1}{y}\right)^2=$ ________.

(a) 9 (b) 81

(c) 4 (d) 32

49. The following are the steps involved in finding the value of $a+b$ from $\frac{2+\sqrt{3}}{2-\sqrt{3}}=a+b\sqrt{3}$. Arrange them in sequential order.

(A) $\frac{2^2+(\sqrt{3})^2+2\times2\times\sqrt{3}}{2^2-(\sqrt{3})^2}=a+b\sqrt{3}$

(B) $a+b=7+4=11$

(C) $\frac{(2+\sqrt{3})(2+\sqrt{3})}{(2-\sqrt{3})(2+\sqrt{3})} = a + b\sqrt{3}$

(D) $\frac{7+4\sqrt{3}}{4-3} = a + b\sqrt{3}$

(E) $a = 7$ and $b = 4$

(a) CDAEB (b) CAEBD
(c) CADEB (d) CEDAB

50. The following are the steps involved in finding the greatest among $\sqrt[3]{2}$, $\sqrt[6]{3}$ and $\sqrt{6}$. Arrange them in sequential order.

(A) The LCM of the denominators of the exponents is 6.

(B) $\therefore \sqrt[6]{216}$ i.e., $\sqrt{6}$ is the greatest.

(C) $\sqrt[3]{2} = 2^{1/3}$, $\sqrt[6]{3} = 3^{1/6}$, $\sqrt{6} = 6^{1/2}$

(D) $2^{1/3} = 2^{2/6}$, $3^{1/6} = 3^{1/6}$, $6^{1/2} = 6^{3/6}$

(E) $\sqrt[3]{2} = \sqrt[6]{4}$ $\sqrt[6]{3} = \sqrt[6]{3}, \sqrt{6} = \sqrt[6]{216}$

(a) CADEB (b) CDABE
(c) DCAEB (d) DACBE

51. If $x = \frac{1}{\sqrt{3}+2}$, then $\left(x + \frac{1}{x}\right)^2 =$ _______.

(a) 16 (b) 3
(c) 12 (d) 6

52. If $\sqrt[x]{3} \times \sqrt[y]{5} = 10125$, then $12xy =$ _______.

[✓ (a) 1] (b) $\frac{1}{3}$
(c) 2 (d) $\frac{1}{2}$

53. If $x = \frac{1}{5+2\sqrt{6}}$, then $x^2 - 10x + 1 =$ _______.

(a) 1 (b) −1
(c) 0 (d) 10

54. If $x = \frac{2}{\sqrt{3}-\sqrt{5}}$ and $y = \frac{2}{\sqrt{3}+\sqrt{5}}$, then $x + y =$ _______.

(a) 3 (b) $4\sqrt{3}$ (c) $-2\sqrt{3}$ (d) 6

55. $\frac{3}{7}$ lies between the fractions _______.

(a) $\frac{4}{9}, \frac{5}{9}$ (b) $\frac{43}{99}, \frac{4}{9}$
(c) $\frac{42}{99}, \frac{4}{9}$ (d) $\frac{41}{99}, \frac{42}{99}$

Level 3

56. If $\sum_{k=4}^{143} \frac{1}{\sqrt{k}+\sqrt{k+1}} = a - \sqrt{b}$, then a and b respectively are

(a) 10 and 0 (b) −10 and 4
(c) 10 and 4 (d) −10 and 0

57. The surd $\frac{12}{3+\sqrt{5}+2\sqrt{2}}$, after rationalizing the denominator becomes

(a) $\sqrt{5} - \sqrt{2} + \sqrt{10} + 1$

(b) $\sqrt{5} + \sqrt{10} + \sqrt{2} + 1$

(c) $\sqrt{10} + \sqrt{2} + \sqrt{5} + 1$

(d) $\sqrt{5} - \sqrt{10} - \sqrt{2} - 1$

58. If $A^{1/A} = B^{1/B} = C^{1/C}$, $A^{BC} + B^{AC} + C^{AB} = 729$.

Which of the following equals $A^{1/A}$?

(a) $\sqrt[ABC]{81}$ (b) $\sqrt{2}$
(c) $\sqrt[ABC]{27}$ (d) $\sqrt[ABC]{9}$

59. If $x = \frac{1}{2-\sqrt{3}}$, the value of $x^3 - 2x^2 - 7x + 10$ is equal to

(a) $2+\sqrt{3}$ (b) 10
(c) $7+2\sqrt{3}$ (d) 8

60. If $x = 1 + 5^{1/3} + 5^{2/3}$, then find the value of $x^3 - 3x^2 - 12x + 6$.

(a) 22 (b) 20
(c) 16 (d) 14

61. $\frac{4}{\sqrt{10-2\sqrt{21}}} =$ _______.

(a) $\frac{1}{4}(\sqrt{7}+\sqrt{3})$ (b) $\frac{1}{4}(\sqrt{7}-\sqrt{3})$
(c) $\sqrt{7}+\sqrt{3}$ (d) $\sqrt{7}-\sqrt{3}$

62. If $y = 3^{1/3} + 3$, then $y^3 - 9y^2 + 27y =$ ____.

(a) 27
(b) −27
(c) −30
(d) 30

63. $\dfrac{1}{\sqrt{8+2+\sqrt{15}}} =$ ______.

(a) $\frac{1}{2}(\sqrt{5}+\sqrt{3})$
(b) $\frac{1}{2}(\sqrt{5}-\sqrt{3})$
(c) $\frac{1}{2}(\sqrt{5}+1)$
(d) $\frac{1}{2}(\sqrt{5}-1)$

64. If $x = 2^{1/3} - 2$, then $x^3 + 6x^2 + 12x =$ ______.

(a) 6
(b) −6
(c) 8
(d) −8

65. $\dfrac{3}{\sqrt{19-2\sqrt{88}}} - \dfrac{8}{\sqrt{14+2\sqrt{33}}} =$ ______.

(a) $\sqrt{19+2\sqrt{33}}$
(b) $\sqrt{14-2\sqrt{88}}$
(c) $\sqrt{11+2\sqrt{24}}$
(d) $\sqrt{11-2\sqrt{55}}$

66. $\sqrt{\sqrt[x]{2^x \sqrt[x^2]{3^{x^3} \sqrt[x^3]{6^{x^6} \sqrt[x^4]{9^{x^{10}}}}}}} =$

(a) 18
(b) 54
(c) 24
(d) 36

67. $\sqrt{7+2\sqrt{6}} + \sqrt{7-2\sqrt{6}} =$ ______.

(a) 14
(b) $\sqrt{6}$
(c) $2\sqrt{6}$
(d) 7

68. $\sqrt{3^2\sqrt{9^2\sqrt{(81)^2\sqrt{16^{16}}}}} =$ ______.

(a) 6×2^4
(b) $3^3 \times 2$
(c) $6^3 \times 2^3$
(d) $6^3 \times 2$

69. $\sqrt[6]{15-2\sqrt{56}}\,\sqrt[3]{\sqrt{7}+2\sqrt{2}} =$ ______.

(a) 0
(b) $\sqrt{2}$
(c) 1
(d) $\sqrt[6]{2}$

70. If $p = 7 - 4\sqrt{3}$, then $\dfrac{p^2+1}{7p} =$ ______.

(a) 2
(b) 1
(c) 7
(d) $\sqrt{3}$

PRACTICE QUESTIONS